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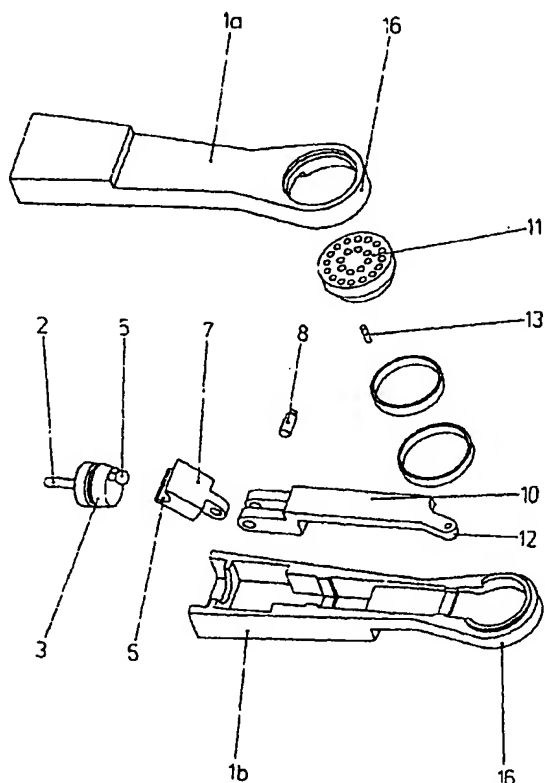
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[Continued on next page]

(54) Title: ELECTRIC TOOTHBRUSH



(57) Abstract: An electric toothbrush has a toothbrush shaft (2) driven in rotation which drives in rotation a driving disc (3) kinematically connected to a control rod (9). At the end of the control rod (9) towards the driving disc (3), a crank (7) is movably mounted about a swivelling axis (8) extending at right angles to the longitudinal axis of the control rod (9). The end of this crank (7) towards the driving disc has a slideway (6) extending parallel with the swivelling axis (8) and with which a guide body (5) slidably engages, this guide body being eccentrically connected by its other end to the driving disc (3).

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- as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii)) for all designations

## Electric toothbrush

\* \* \* \* \*

## DESCRIPTION

5 The invention relates to an electric toothbrush with a toothbrush shaft driven in rotation which drives in rotation a driving disc kinematically connected to a control rod which has a connection to a bristle carrier disc pivotably mounted in a toothbrush head about an axis set at right angles to the control rod.

10 An electric toothbrush of the above kind is the subject-matter of DE 19802904. In the case of the toothbrush described in this publication, the control rod is formed as a rod which is able to pivot in a lead-through, with one end of the rod driven by the driving disc with a gyratory  
15 motion and the other end driving the bristle carrier disc with an oscillating motion. The known toothbrush is relatively complicated in design, and cannot be manufactured entirely from plastic material.

20 The basic problem of the invention is to design an electric toothbrush of the kind stated at the outset so that it can be manufactured as inexpensively as possible.

This problem is solved in accordance with the invention by arranging at the control rod end towards the driving disc a crank movably mounted about a swivelling axis extending at  
25 right angles to the longitudinal axis of the control rod and by providing the crank end towards the driving disc with a slideway extending parallel with the swivelling axis and with which a guide body slidably engages, this guide body being eccentrically connected by its other end to the  
30 driving disc.

Further features of the invention are disclosed by the dependent claims; the following developments of the invention are especially worthy of mention.

- 2 -

If the control rod is provided, within the toothbrush head, with a fork, set at right angles to its main extension direction, with which an eccentric cam of the bristle carrier disc engages, the control rod can be displaceably  
5 mounted in a straight guide, and need not have regions elastically deformable transversely with respect to its main extension.

If a bristle carrier ring is arranged coaxially with the bristle carrier disc in the toothbrush head and the control  
10 rod has, in addition to the fork kinematically connected to the bristle carrier disc, another fork with which an eccentric cam of the bristle carrier ring engages, the toothbrush head can have two sets of bristle tufts moving in opposite directions.

15 If two bristle carrier discs are arranged one behind the other in the main extension direction of the control rod, each kinematically connected to the control rod, the toothbrush is capable of brushing a particularly large region of the teeth at once.

20 With such an embodiment, it is still possible for each of the two bristle carrier discs to be surrounded by a bristle carrier ring, and for both the bristle carrier discs and the bristle carrier rings to be kinematically connected to the control rod.

25 The drive to the bristle carrier discs and bristle carrier rings can again be realized by forks and cams, by providing the control rod with two pairs of forks arranged opposite to one other, one pair behind the other, with an eccentric cam of either a bristle carrier disc or a bristle carrier  
30 ring engaging each fork.

The bristle carrier disc is given an optimal mounting in the toothbrush head by being connected fixedly in rotation to a bearing disc which, in its turn, pivotably rests on a

bearing plate held fixedly in rotation in the toothbrush head.

The bristle carrier ring can be mounted in a similar way by being connected fixedly in rotation to a bearing ring which  
5 surrounds the bearing disc and which, in its turn, is pivotably mounted on the bearing plate.

Such an embodiment can have a particularly simple configuration if the bristle carrier ring is positioned radially on the bearing plate by axial projections of the  
10 bearing plate.

The electric toothbrush can be manufactured particularly inexpensively by making bearing plate, bearing disc and bearing ring in the form of metal sheets.

Making the control rod with forks and crank in the form of  
15 metal sheets will also help to further reduce production costs.

In the further description of the invention, reference will be made to the drawing, in which

Fig. 1 shows a longitudinal section through a forward  
20 region of a toothbrush according to the invention,

Fig. 2 is an exploded perspective view of the region shown in Figure 1,

Fig. 3 is an exploded perspective view of the parts of a further embodiment of the toothbrush that are essential to  
25 the invention,

Fig. 4 is a longitudinal section through a forward region of the toothbrush with the components of Figure 3,

Fig. 5 is a view from above of the important driving parts in the toothbrush head, as seen from above,

30 Fig. 6 is a similar view to Figure 5, as seen from below,

Fig. 7 is an exploded perspective view of the parts of a further embodiment of the toothbrush that are essential to the invention,

- 5 Fig. 8 is a longitudinal section through a forward region of the toothbrush with the components of Figure 7.

Figure 1 shows a brush casing 1, into which a toothbrush shaft 2 with a driving disc 3 projects. A crank pin 4 with a ball-shaped guide body 5 projects eccentrically from the  
10 free end face of the driving disc 3. This guide body 5 engages a slideway 6 of a crank 7.

The crank 7 is connected, by the end remote from the guide body 5, to a control rod 9 by means of a swivel pin 8 which extends parallel with the slideway 6. As can be seen from  
15 Figure 1, the control rod 9 has a knee region 10 in it for this purpose.

The end of the control rod 9 remote from the crank 7 is kinematically connected to a bristle carrier disc 11 which is mounted in a toothbrush head 16.

- 20 The exploded view in Figure 2 shows that the brush casing 1 consists of two casing halves 1a and 1b. It can be seen that the control rod 10 has a shoulder 12 which is angled obliquely outwards and is eccentrically connected by an eccentric pin 13 to the bristle carrier disc 11.

- 25 The function of the drive will be easily understood from Figure 2. The gyratory motion of the guide body 5 causes the crank 7 to swivel about its axis 8 as the guide body 5 slides to and fro in the slideway 6. The swivelling action of the crank 7 causes the control rod 10 to move to and fro  
30 (to right and left as seen in Figure 2), driving the bristle carrier disc 11 with an oscillatory motion.

In the case of the embodiment shown in Figure 3, the control rod 9 and the crank 7 are in the form of metal sheets. This control rod 9 has two opposite to one other forks 24, 25 at its free end. The to-and-fro motion of the control rod 9 in the longitudinal direction is imparted by the revolving driving disc 3 by its eccentric crank pin 4, in the same way as in the previously described embodiment.

The toothbrush shown in Figures 3 and 4 does not just have a bristle carrier disc 11 only, but also has a bristle carrier ring 14 that coaxially surrounds the bristle carrier disc 11. A bearing plate 15, which is fixed in the toothbrush head referenced 16 in Figures 1 and 2, serves as bearing for the bristle carrier disc 11 and bristle carrier ring 14. Above the bearing plate 15, a bearing disc 17, which is pivotably held on the bearing plate 15 by an axle 18, is shown. The bearing disc 17 has three upwards pointing arms 19 and an eccentric cam 20 pointing the opposite way.

Also shown in Figure 3 is a bearing ring 21 which likewise has upwards pointing arms 22 and a downwards pointing eccentric cam 23. This bearing ring 21 is likewise held on the bearing plate 15, and for this purpose has upwards pointing guide projections (not shown).

Figure 4 shows how the bearing disc 17 and bearing ring 21 rest on the bearing plate 15 in the assembled condition, and are pivotable by means of the eccentric cams 20, 23 of the control rod 9 which engage the forks 24, 25 shown in Figure 3.

Figure 5 shows, viewed from above, the bearing plate 15 and the bearing disc 17 thereon, with its three upwards pointing arms 19 and the downwards pointing eccentric cam 20. This cam 20 reaches through an opening 26 in the bearing plate 15. The bearing ring 21 with its arms 22 and eccentric cam 23 can also be seen in Figure 5. The cam 23 engages in a recess 27 in the rim of the bearing plate 15.

Figure 6 makes clear how the two eccentric cams 20 and 23 reach through the opening 26 and recess 27 respectively.

The embodiment shown in Figures 7 and 8 differs from the embodiments previously described in that two bristle carrier discs 11, 11' and two bristle carrier rings 14, 14' are arranged one behind the other in the toothbrush head 16'. These components are driven in exactly the same way as described above. Accordingly, the control rod 9 in this embodiment has two pairs of forks 24, 25 and 24', 25' arranged one behind the other.

#### List of reference numbers

- 1 brush casing
- 2 toothbrush shaft
- 3 driving disc
- 15 4 crank pin
- 5 guide body
- 6 slideway
- 7 crank
- 8 swivel pin or axis
- 20 9 control rod
- 10 region
- 11 bristle carrier disc
- 12 shoulder
- 13 eccentric pin
- 25 14 bristle carrier ring
- 15 bearing plate



- 16 toothbrush head
- 17 bearing disc
- 18 axle
- 19 arm
- 5 20 eccentric cam
- 21 bearing ring
- 22 arm
- 23 eccentric cam
- 24 fork
- 10 25 fork
- 26 opening
- 27 recess

## CLAIMS

1. Electric toothbrush comprising a toothbrush shaft (2) driven in rotation, said shaft (2) driving in rotation a driving disc (3) kinematically connected to a control rod (9) having a connection to a bristle carrier disc (11) pivotably mounted in a toothbrush head about an axis transversal with respect to the control rod (9), characterized in that at the end of the control rod (9) towards the driving disc (3) a crank (7) is movably mounted about a swivelling axis (8) extending transversally with respect to the longitudinal axis of the control rod (9) and in that the end of the crank (7) towards the driving disc has a slideway (6) extending parallel with the swivelling axis (8), a guide body (5) being slidably engaged in said slideway (6), said guide body (5) being eccentrically connected to the driving disc (3) by its other end.
2. Electric toothbrush according to claim 1, characterized in that the guide body (5) engages by a ball head the slideway (6), and the slideway (6) has a cross-section correspondingly formed as a segment of a circle.
3. Electric toothbrush according to claims 1 or 2, characterized in that the slideway (6) clamps the ball head according to an angle greater than  $180^{\circ}$ .
4. Electric toothbrush according to at least one of the preceding claims, characterized in that the control rod (9) is formed with a knee at the driving disc (3) end, and the crank (7) is linked thereto at the free end of a knee region (10).
5. Electric toothbrush according to at least one of the preceding claims, characterized in that at the control rod (9) end towards the bristle carrier disc (11) the control rod (9) has a shoulder (12) which is obliquely oriented outwards in a parallel manner with respect to the plane of the bristle carrier disc (11), said shoulder (12) being

connected to the bristle carrier disc (11) by an eccentric pin (13).

6. Electric toothbrush according to at least one of the preceding claims, characterized in that the control rod (9) comprises, within the toothbrush head (16), a fork (24), oriented in a transversal manner with respect to the main extension direction thereof, an eccentric cam (20) of the bristle carrier disc (11) engaging said fork (24).

7. Electric toothbrush according to claim 6, characterized in that a bristle carrier ring (14) is arranged coaxially with the bristle carrier disc (11) in the toothbrush head (16) and in that the control rod (9) comprises, in addition to the fork (24) kinematically connected to the bristle carrier disc (11), an additional fork (25), an eccentric cam (23) of the bristle carrier ring (14) engaging said additional fork (25).

8. Electric toothbrush according to at least one of the preceding claims, characterized in that two bristle carrier discs (11, 11') are arranged one behind the other in the main extension direction of the control rod (9), each of said discs (11, 11') being kinematically connected to the control rod (9).

9. Electric toothbrush according to claim 8, characterized in that both bristle carrier discs (11, 11') are surrounded by a bristle carrier ring (14, 14'), and both the bristle carrier discs (11, 11') and the bristle carrier rings (14, 14') are kinematically connected to the control rod (9).

10. Electric toothbrush according to claim 9, characterized in that the control rod (9) comprises two pairs of forks (24, 25; 24', 25') arranged opposite to one other, one pair behind the other, with an eccentric cam (20, 23) of a bristle carrier disc (11, 11') or a bristle carrier ring (14, 14') engaging each fork.

- 10 -

11. Electric toothbrush according to at least one of the preceding claims, characterized in that the bristle carrier disc (11) is connected in a pivotably fixed manner to a bearing disc (17) which, in turn, pivotably rests on a bearing plate (15) held in a pivotably fixed manner in the toothbrush head (16).

12. Electric toothbrush according to claim 11, characterized in that the bristle carrier ring (14) is connected in a pivotably fixed manner to a bearing ring (21) which surrounds the bearing disc (17) and which, in turn, is pivotably mounted on the bearing plate (15).

13. Electric toothbrush according to claim 12, characterized in that the bearing ring (21) is radially positioned on the bearing plate (15) by axial projections of the bearing plate (15).

14. Electric toothbrush according to at least one of the preceding claims, characterized in that the bearing plate (15), the bearing disc (17) and the bearing ring (21) are in the form of metal sheets.

15. Electric toothbrush according to at least one of the preceding claims, characterized in that the control rod (9) with the forks (24, 25; 24', 25') and the crank (7) are in the form of metal sheets.

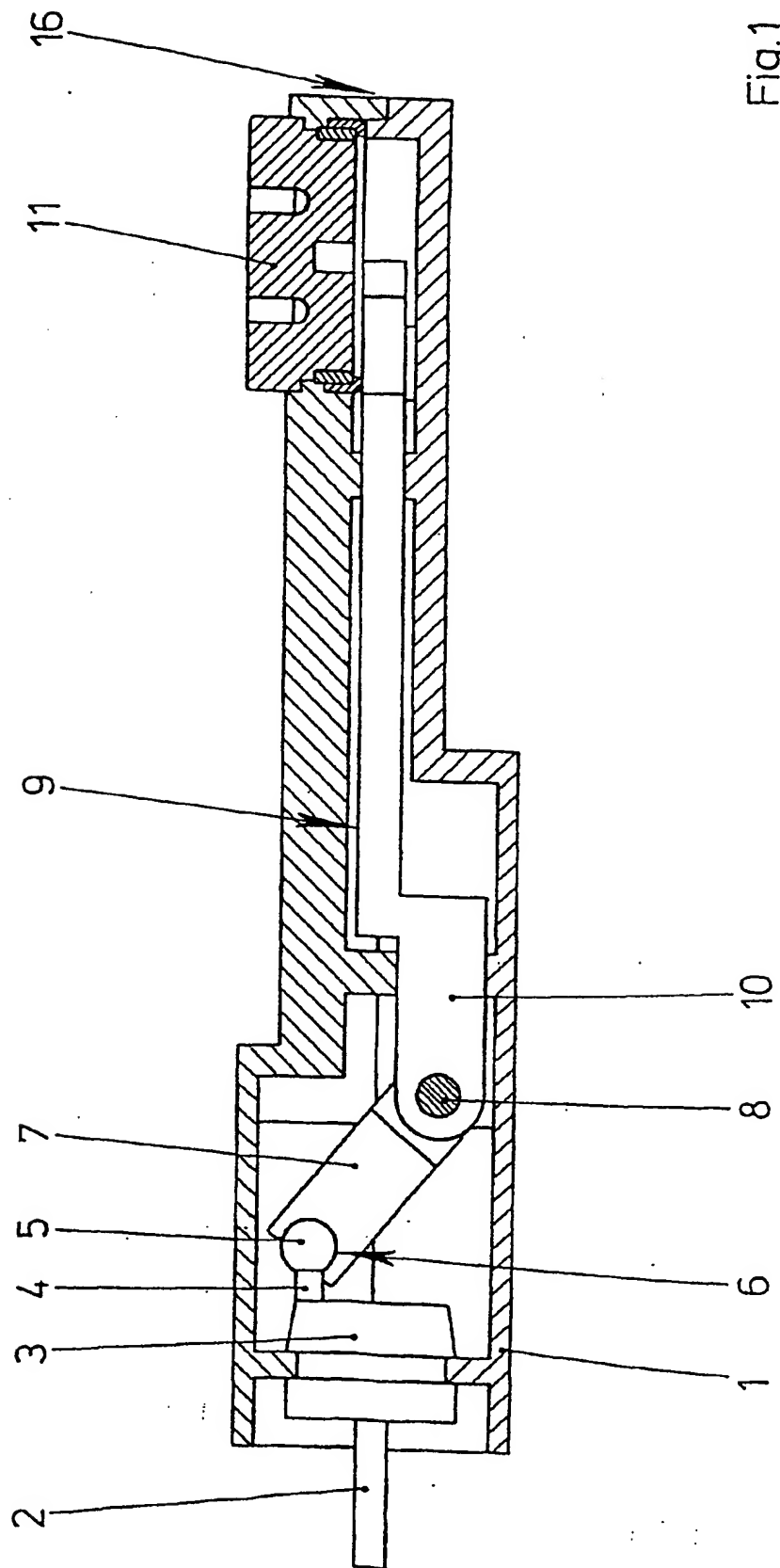


Fig.1

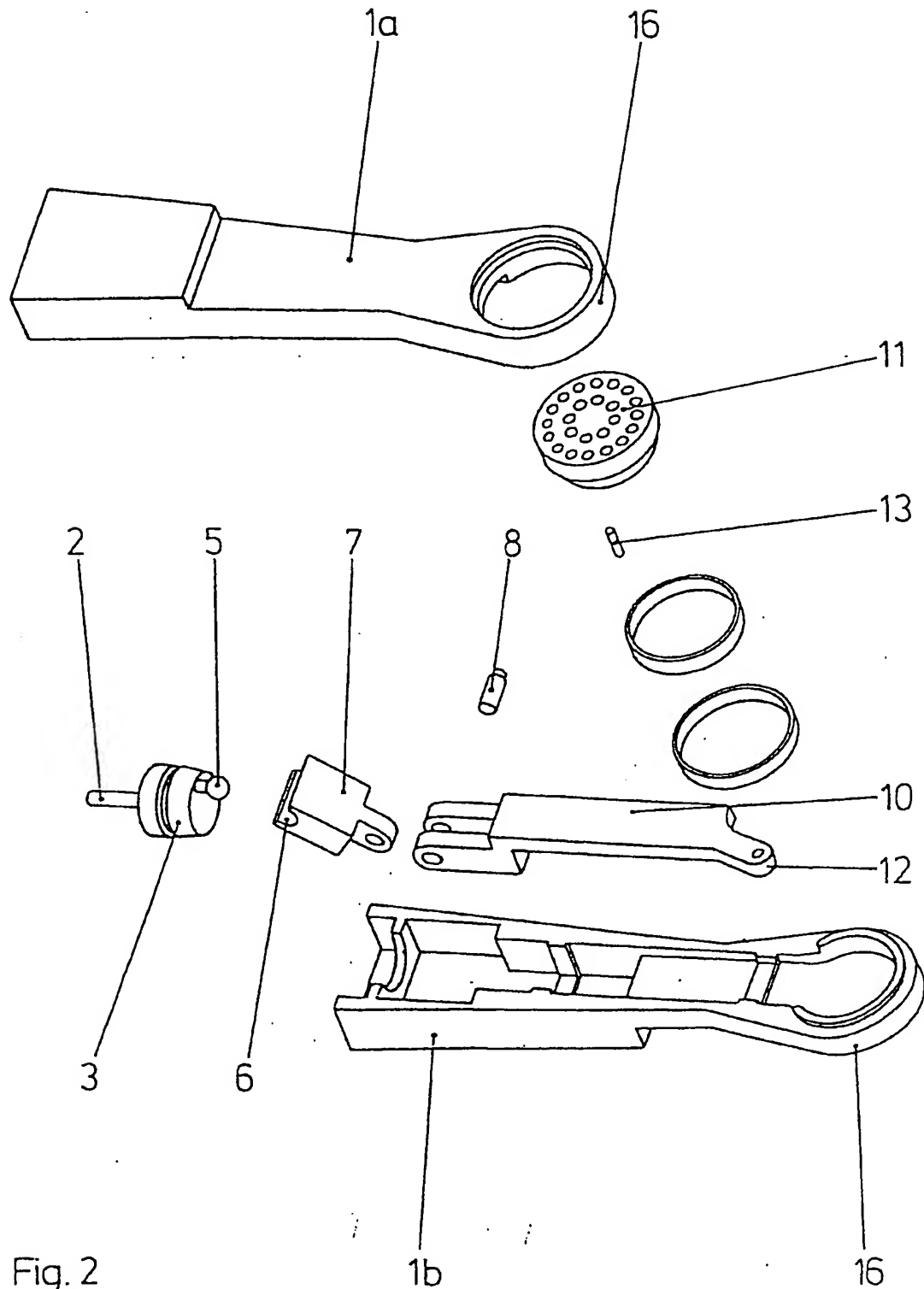


Fig. 2

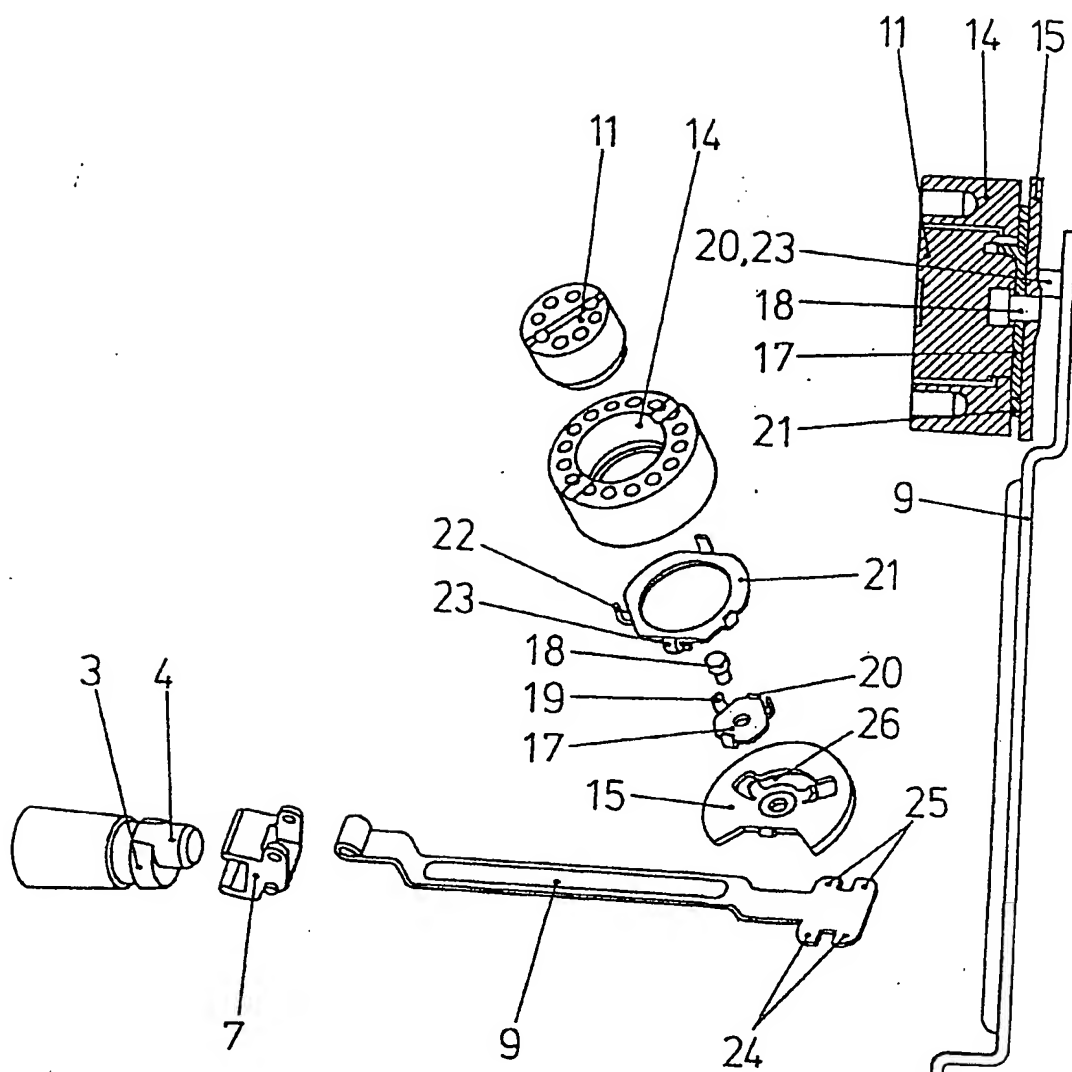


Fig. 3

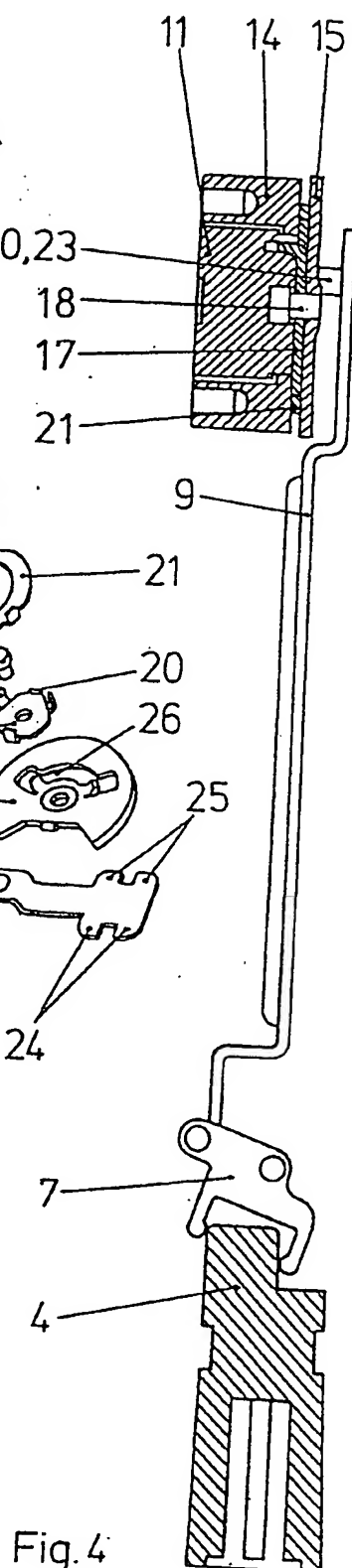


Fig. 4

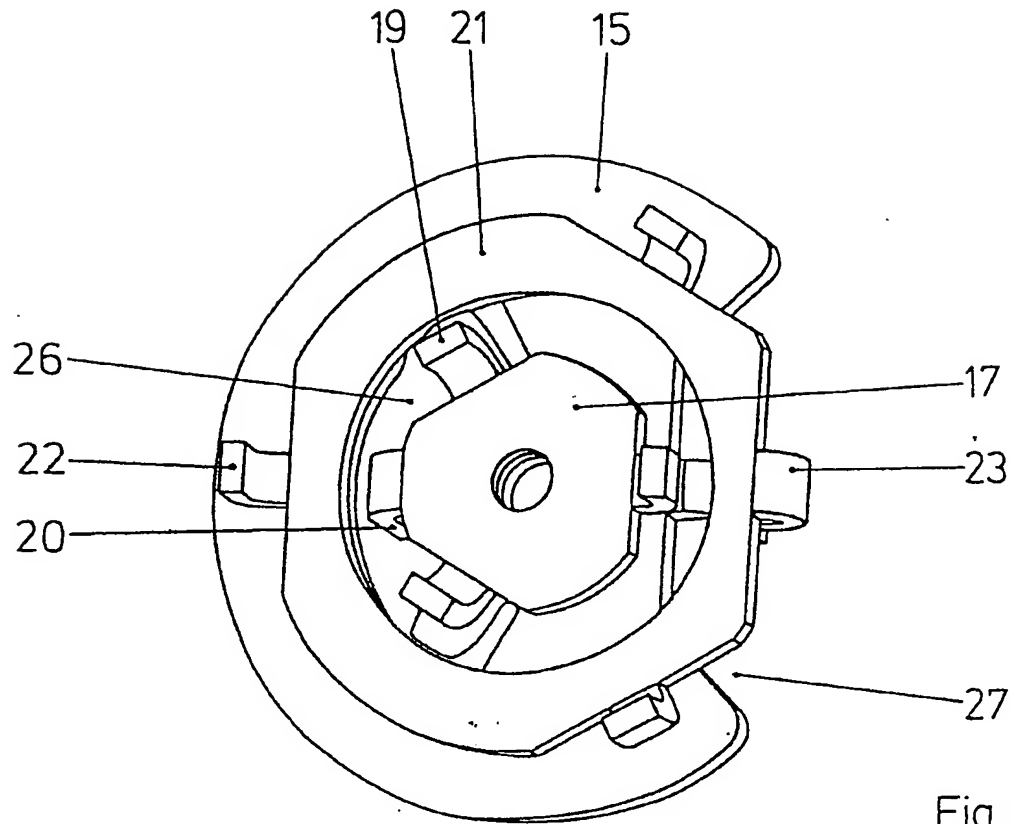


Fig. 5

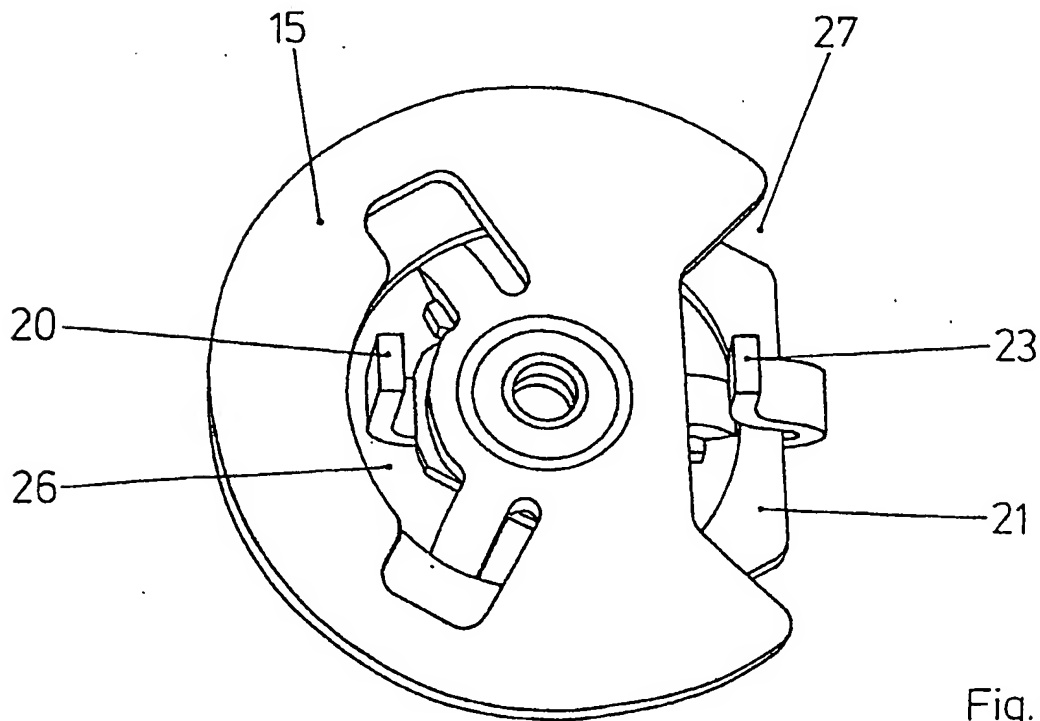


Fig. 6



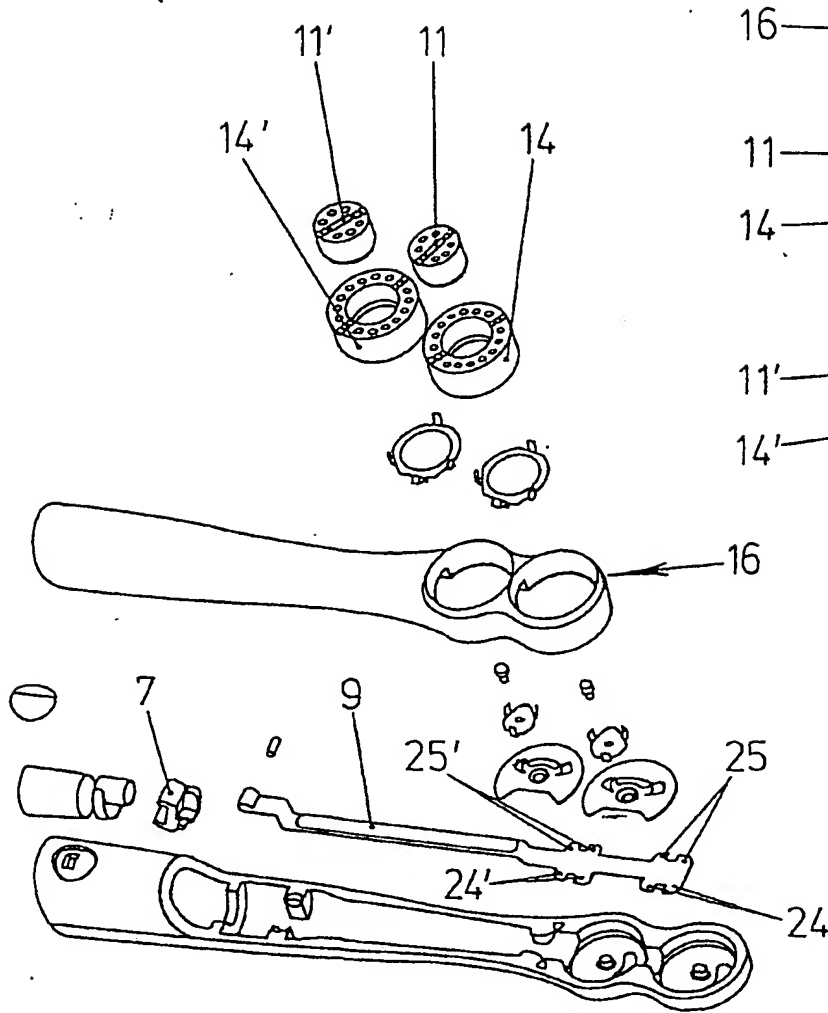


Fig. 7

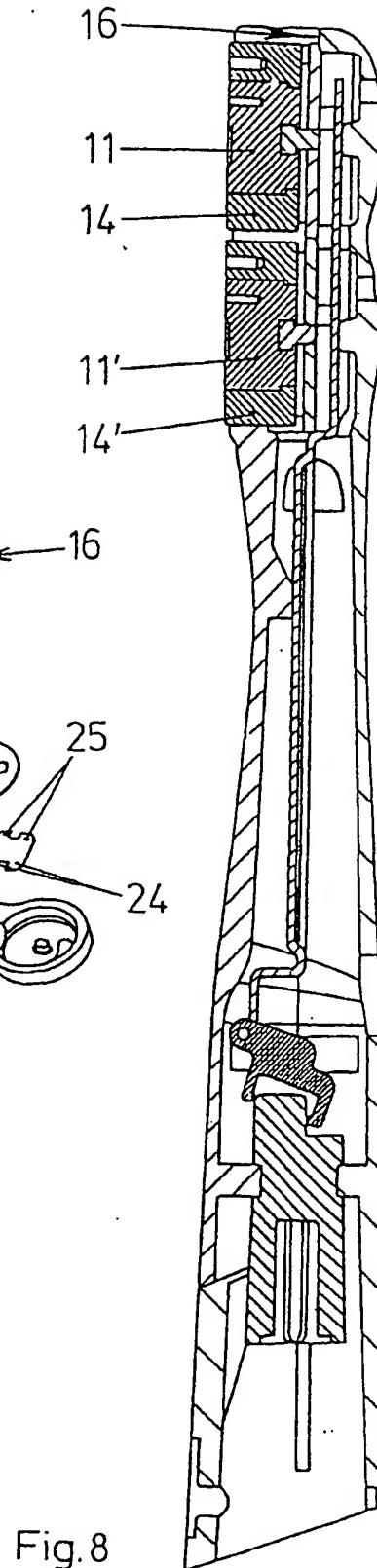


Fig. 8

## INTERNATIONAL SEARCH REPORT

International Application No

PCT/EP 02/02300

A. CLASSIFICATION OF SUBJECT MATTER  
IPC 7 A61C17/34

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)  
IPC 7 A61C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the International search (name of data base and, where practical, search terms used)  
EPO-Internal

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	DE 198 02 904 A (FINALPINA) 29 July 1999 (1999-07-29) cited in the application figures	1
A	DE 196 03 851 A (FINALPINA ) 7 August 1997 (1997-08-07) figures	1
A	FR 1 525 112 A (NARBONI) 17 May 1968 (1968-05-17) figures	1
A	EP 1 072 233 A (ADDWAY ENGINEERING) 31 January 2001 (2001-01-31) figures	1
-/-		

☒ Further documents are listed in the continuation of box C.☒ Patent family members are listed in annex.

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Date of the actual completion of the international search

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## INTERNATIONAL SEARCH REPORT

International Application No.

PCT/EP 02/02300

## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5 033 150 A (GROSS ET AL.) 23 July 1991 (1991-07-23) figures	1

# INTERNATIONAL SEARCH REPORT

information on patent family members

International Application No

PCT/EP 02/02300

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